WHAT IS CLAIMED IS:

1. In a filtered cathodic-arc plasma source having:

a consumable cathode with an end working surface emitting cathode-material plasma in response to vacuum arc engagement;

a tubular anode adjacent and coaxial with said consumable cathode;

cathodic and anodic plasma focusing magnetic coils surrounding said consumable cathode and said tubular anode respectively;

said consumable cathode, tubular anode and focusing magnetic coils comprising a first plasma generator;

a plasma filter disposed in communication with said first plasma generator and including input and output rectilinear plasma ducts each surrounded by direct current magnetic coils;

said plasma ducts and said plasma generator anode comprising a plasma-guiding channel having at least one exit opening and having a channel configuration exclusive of direct line-of-sight plasma communication between said plasma generator cathode and said exit opening; and

electrical energy power supplies for said vacuum arc and said magnetic coils;

the improvement comprising:

said input and output rectilinear plasma ducts connect in a right angle junction wherein a wall opening in said input plasma duct enables plasma communication between said input and output rectilinear plasma ducts;

said direct current magnetic coils surrounding said input and output rectilinear plasma ducts are supplemented by first and second magnetic field lines adjustment magnetic coils disposed around said input and output rectilinear plasma ducts at said right angle junction and energized by electrical energy power supplies; and

said electrical energy power supplies for said direct current magnetic coils surrounding said input and output rectilinear plasma ducts and for said magnetic field lines adjustment magnetic coils include magnetic field adjustment means for configuring magnetic field lines within said output plasma duct as smooth, plasma conveying, low plasma loss continuations of magnetic field lines within said input plasma duct.

2. The filtered cathodic-arc plasma source of claim 1 wherein said first and second magnetic field lines adjustment magnetic coils each include a first circular portion disposed around said input rectilinear plasma duct and a second flared portion residing substantially orthogonal to said first circular portion and disposed around said output rectilinear plasma duct.

3. The filtered cathodic-arc plasma source of claim 1 further including an output duct entrance magnetic coil in coaxial disposition with said output plasma duct on an opposed

lateral surface of said input plasma duct from said output plasma duct and wherein electrical current generating an opposed magnetic polarity flows in windings of said output duct entrance magnetic coil and said output rectilinear plasma duct direct current magnetic coil.

4. The filtered cathodic-arc plasma source of claim 3 wherein said output duct entrance magnetic coil has an inside diameter intermediate an outside diameter of said input duct and a length dimension of said input duct.

5. The filtered cathodic-arc plasma source of claim 1, wherein said direct current magnetic coils surrounding said input rectilinear plasma duct comprise a first plasma input duct magnetic coil disposed adjacent an open ended entrance portion of said input rectilinear plasma duct and a second plasma input duct magnetic coil disposed adjacent a distal closed end particle trap portion of said input rectilinear plasma duct.

6. The filtered cathodic-arc plasma source of claim 1 wherein electrical current generating a same magnetic polarity flows in said first magnetic field lines adjustment magnetic coil and said first plasma input duct magnetic coil and electrical current generating an opposed magnetic polarity flows in both winding turns of said second magnetic field lines adjustment magnetic coil and said second plasma input duct magnetic coil.

7. The filtered cathodic-arc plasma source of claim 1 wherein said input rectilinear plasma duct further includes an electrically isolated plasma component collecting electrode element distally located with respect to said tubular anode element and in a closed end portion of said input rectilinear plasma duct.

8. The filtered cathodic-arc plasma source of claim 1 further including a second plasma generator apparatus connected to said input plasma duct at an end thereof distal to said first plasma generator apparatus.

9. The filtered cathodic-arc plasma source of claim 1 wherein said wall opening in said input plasma duct comprises a circumferential slit covered by an electrically insulated screen and wherein said circumferential slit and said electrical insulated screen are disposed in coincidence with a magnetic cusp trap zone generated by magnetic coil fields within said input and output ducts.

10. The filtered cathodic-arc plasma source of claim 1 wherein electrical current generating a same magnetic polarity flows in said first magnetic field lines adjustment magnetic coil and said first plasma input duct magnetic coil and electrical current generating same magnetic polarities flows in windings of said output duct entrance magnetic coil and said output rectilinear plasma duct direct current magnetic coil.

11. The filtered cathodic-arc plasma source of claim 1 wherein said plasma-guiding channel plasma ducts further include circumferentially disposed internal fin member particle trapping elements.

12. The method of generating filtered high quality cathodic-arc plasma comprising the steps of:

disposing a cathodic arc source of electrons, ions and other plasma components within an evacuation chamber contiguously connecting with a right angle bend-inclusive plasma magnetic filter apparatus;

establishing a curvilinear pattern of plasma flow controlling equipotential magnetic flux lines within said right angle bend-inclusive plasma magnetic filter apparatus using a plurality of surrounding electrical magnetic elements received in selected right-angle bend-removed locations of said plasma magnetic filter apparatus; and

enhancing said curvilinear pattern of plasma flow controlling magnetic flux lines within said right angle bend-inclusive plasma magnetic filter apparatus by adding output duct entrance magnetic coil and corrective magnetic element magnetic fluxes to said curvilinear pattern;

said output duct entrance magnetic coil and corrective magnetic coil element magnetic fluxes limiting losses from a flow of selected plasma components traversing said filter apparatus along said magnetic flux lines;

said enhancing and limiting steps including altering said established equipotential flux lines with supplementing magnetic flux received from output duct entrance magnetic coil and multi planar corrective magnetic coil element flux sources of selected flux configuration and flux magnitude disposed adjacent said right angle bend of said filter apparatus.

13. The method of generating filtered high quality cathodic-arc plasma of claim 12 wherein said enhancing and limiting steps further include reducing sidewall collision events in said right angle bend-inclusive plasma magnetic filter apparatus.

14. The method of generating filtered high quality cathodic-arc plasma of claim 12 wherein said step of enhancing said flow of selected plasma components through said filter apparatus include selecting said magnetic fluxes in response to generating an enhanced flow of electrons through said filter apparatus and generating an enhanced flow of plasma components attracted to said enhanced electron flow.

15. The method of generating filtered high quality cathodic-arc plasma of claim 12 wherein said step of enhancing said curvilinear pattern of plasma flow controlling magnetic flux lines within said right angle bend-inclusive plasma magnetic filter apparatus and a flow of selected plasma components through said filter apparatus includes establishing magnetic flux magnitudes within said magnetic filter apparatus wherein:

a Larmour radius characteristic of electrons in said flowing plasma electrons is selected to be much less than a radius dimension of an enclosing duct member of said plasma magnetic filter apparatus, and

a Larmour radius characteristic of ions in said flowing plasma ions is controlled to be greater than said radius dimension of an enclosing duct member of said plasma magnetic filter apparatus.

16. A purified cathodic arc plasma generator comprising the combination of:

cathode arc particle generating apparatus;

magnetic particle segregation apparatus disposed in particle axial communication with said cathode arc particle generating apparatus and including a right angle bend portion connecting input and output path portions along a path of particle axial communication;

said magnetic particle segregation apparatus including a first plurality of electromagnetic field generating elements disposed along said input and output portions of said path of particle axial communication in locations distal of said particle path right angle bend portion; and

a second plurality of electromagnetic field generating elements disposed along said path of particle axial communication in locations adjacent said particle path right angle bend;

said second plurality of electromagnetic field generating elements including a magnetic coil disposed adjacent said input portion of said path of particle axial communication at said right angle bend and in coaxial alignment with said output portion of said path of particle axial communication;

said second plurality of electromagnetic field generating elements also including a pair of saddle-like magnetic coils surrounding said input portion and adjacent said output portion of said path of particle axial communication in locations immediately preceding and immediately succeeding said right angle bend.

17. The purified cathodic arc plasma generator of claim 16 wherein said cathode arc particle generating apparatus includes first and second cathodic-arc plasma generators disposed in particle axial communication with a portion of said magnetic particle segregation apparatus.

18. The purified cathodic arc plasma generator of claim 17 wherein said cathode arc particle generating apparatus includes third and fourth cathodic-arc plasma generators disposed in particle axial communication with a selected portion of said magnetic particle segregation apparatus.

19. The purified cathodic arc plasma generator of claim 18 wherein said cathode arc particle generating apparatus include a plurality of differing cathode materials.

20. The purified cathodic arc plasma generator of claim 16 further including a plurality of said magnetic particle segregation apparatus output portions disposed in axial alignment along, and in orthogonal disposition with, said magnetic particle segregation apparatus input portion.

21. The purified cathodic arc plasma generator of claim 16 further including a supplemental magnetic coil-attended lengthening section connected with said magnetic particle segregation apparatus output portion at an output port thereof.

22. The purified cathodic arc plasma generator of claim 16 wherein said particle axial communication includes particle electron and ion motions within a Larmour radii range of $\rho_e << a < \rho_i$ where ρ_e and ρ_i are, Larmour radius of electrons and Larmour radius of ions respectively and a is a radius of a particle conveying duct in said particle segregation apparatus.

23. The purified cathodic arc plasma generator of claim 22 wherein said magnetic particle segregation apparatus first plurality of electromagnetic field generating elements are characterized by generation of magnetic field intensities enabling said Larmour radii range of $\rho_e << a < \rho_i$.

24. Purified cathodic arc plasma source apparatus comprising the combination of:

a cathode arc source of electrons, ions and additional cathode arc generated particles;

an input duct element disposed in axial communication with said cathode arc source of electrons, ions and additional cathode arc generated particles;

a first input duct electrical magnetic coil disposed surrounding said input duct element and energized by a source of selected magnitude electrical energy;

an output duct element disposed in substantially orthogonal communication with a downstream portion of said input duct element and with input duct element electrons and ions influenced by said first input duct electrical magnetic coil;

an output electrical magnetic coil disposed surrounding said output duct element and energized by a source of selected magnitude electrical energy;

a second input duct electrical magnetic coil disposed surrounding said input duct element in an input duct location downstream of said output duct element and energized by a source of selected magnitude electrical energy;

a first saddle shaped ion path correcting magnetic coil disposed surrounding said input duct element in a downstream location preceding said output duct element and partially surrounding said output duct element adjacent said input duct element and energized by a source of selected magnitude electrical energy; and

a second saddle shaped ion path correcting magnetic coil disposed surrounding said input duct element in a downstream location succeeding said output duct element and partially surrounding said output duct element adjacent said input duct element and energized by a source of selected magnitude electrical energy.

25. The purified cathodic arc plasma source apparatus of claim 24 further including a output duct entrance magnetic coil coaxially disposed with respect to said output duct element

on an opposed side of said input duct element with respect to said output duct element and energized by a source of selected magnitude electrical energy.

26. The purified cathodic arc plasma source apparatus of claim 24 further including an electron collection electrode located in an input duct downstream location succeeding said output duct element and said correcting magnetic coils and adjacent said second input duct electrical magnetic coil.

27. The purified cathodic arc plasma source apparatus of claim 24 further including an output duct port located at an end of said output duct element distal of said input duct element and wherein said substantially orthogonal input duct element to output duct element communication includes a curved path exclusive of line of sight communication between a cathode in said cathode arc source and said output duct port.

28. The purified cathodic arc plasma source apparatus of claim 27 further including an energized supplemental magnetic coil attended output duct element extension member disposed intermediate said output duct element and said output duct port.

29. The purified cathodic arc plasma source apparatus of claim 24 further including a screen covered slit aperture located in said input duct element and opening into said output duct element and wherein said slit aperture is disposed in coincidence with a magnetic flux pattern defined cusp region within said input and output duct elements.

30. The purified cathodic arc plasma source apparatus of claim 24 wherein said sources of selected magnitude electrical energy are direct current electrical energy sources.

31. The purified cathodic arc plasma source apparatus of claim 24 wherein said cathode arc source of electrons is energized by one of a direct current electrical energy source and a pulsed electrical energy source.